

REMARKS

Status of Application

Claims 1-10 are pending. The remaining claims have been withdrawn by the Examiner as directed to non-elected inventions. These claims have been cancelled without prejudice to their prosecution in other application(s). Applicant acknowledges the removal of all prior rejections based on Boxhoorn in view of Cheung.

Amendment to Independent Claims 1 and 2.

Part c) of each of independent claims 1 and 2 have been amended to incorporate the phrase "to react the modifier with a surface of the alpha-alumina". Support for this amendment can be found in the present application at least at page 4, lines 1-7, page 5, lines 22-25, and page 9, lines 17-25. Part e) of independent claim 2 has been amended to add "and washing" after "calcining". Support for this amendment can be found in the present application at least at page 10, lines 18-20.

Claim Rejections

The Office Action finds that claims 1-3 and 6-10 are rejected under 35 U.S.C. § 103 as being unpatentable over US Patent No. 5,929,259 by Lockemeyer (1), in view of US Patent Pub. No. 2002/0143197 by Lockemeyer (2) and US Patent No. 6,398,998 by Lockemeyer (3).

Applicant respectfully traverses the rejection and requests reconsideration of the patentability of the claims.

Lockemeyer (1) is directed to a method of imparting improved physical properties such as crush strength and abrasion resistance to a catalyst support such as alpha-alumina. Lockemeyer (1) states that adding a titania component into the mixture fired to produce the carrier results in improved crush strength and abrasion resistance, but also affects the densification of the carrier structure and that this problem increases with increasing concentrations of added titania. (Col. 1, lines 55-59) Lockemeyer (1) concerns finding a way to incorporate the titania component into the carrier without causing such densification. Lockemeyer (1) teaches that the way to solve the problem is to impregnate the preformed carrier with a titania generator in a liquid medium, as titania itself is not soluble in water. (Col. 2, lines 62- 63) Lockemeyer (1) defines the term "titania generator" to "embrace all such suitable soluble titanium compounds, slurries and sols that, under the conditions under which the carrier is produced, form titania". (Col. 3, lines 9-12) Lockemeyer (1) teaches that

the calcination of the impregnated carrier is carried out under conditions adapted to generate titania. **Furthermore, “[i]n the presence of alumina, the calcination can result in the formation of aluminum titanate which is, in general, less preferred than titania.”** (Col. 3, lines 46-50)(emphasis added)

The Examiner acknowledged that “Lockemeyer (1) is silent with regards to (1) the modifier being at least one alkali metal hydroxide aqueous solution and a washing step prior to the deposition of the catalytic material on the calcined carrier”. Applicant submits that Lockemeyer (1) further teaches away from using an aqueous solution of at least one metal hydroxide as the modifier, because Lockemeyer (1) teaches that the reaction of the titania modifier and the alumina carrier is **not** desirable. In contrast, the present invention is specifically directed to the reaction of the modifier with a surface of the pre-formed alpha-alumina carrier:

While the present invention should be understood as being unconstrained by any particular theory, it is believed that during the calcining, **the alkali metal hydroxide reacts with the alumina**, and that this reaction contributes to the favorable characteristics which have been observed in the carriers of the present invention, and in catalysts employing these carriers. **In the case where alpha-alumina is impregnated with sodium hydroxide modifier, such reacting is believed to result in the emergence of beta-aluminate phase, that is, $\beta\text{-NaAl}_{11}\text{O}_{17}$** , as well as some NaAl_5O_8 . The presence of beta-aluminate phase and/or NaAl_5O_8 is believed to signify that reaction referred to above in this paragraph has occurred. (emphasis added)

Nor do the teachings of Lockemeyer (2) supply what is needed to combine with Lockemeyer (1) to arrive at the present invention. Lockemeyer (2) teaches that to make a catalyst from the carrier, the carrier is typically impregnated with a metal compound(s), complex (es) and/or salt(s) to deposit or impregnate a catalytically effective amount of metal on the carrier. [0015] Lockemeyer teaches the following with regard to promoters:

In addition, one or more promoters may also be deposited on the carrier either prior to, coincidentally with, or subsequent to the deposition of the catalytically reactive metal. The term “promoter” as used herein refers to a component which works effectively to provide in one or more of the catalytic properties of the catalyst when compared to a catalyst not containing such promoter. [0015]

One or more promoters may be deposited either prior to, coincidentally with, or subsequent to the deposition of the metal. Promoters for epoxidation catalysts are typically selected from sulfur, phosphorus, boron, fluorine, Group IA through Group VIII metals, rare earth metals, and combinations thereof. [0023]

For olefin epoxidation catalysts, Group IA metals are typically selected from potassium, rubidium, cesium, lithium, **sodium**, and combinations thereof; with potassium and/or cesium and/or rubidium being preferred. [0024]

Notably, Lockemeyer (2) characterizes the promoter as enhancing *catalytic properties of the catalyst*. Lockemeyer (2) does not suggest the improvement of any physical characteristics *of the preformed carrier* from using the promoter. Thus, one of skill in the art would not be motivated to combine the teachings concerning the deposition of a promoter (Lockemeyer (2)) with the teachings to modify the physical properties of the carrier (Lockemeyer (1)).

Further, Lockemeyer (1) teaches away from a chemical reaction between the modifier and the alumina. Lockemeyer (2) does not teach the desirability of such a chemical reaction, or a method of achieving it. Lockemeyer (2) teaches only that a promoter is to be "deposited" on the carrier prior to, coincidentally with, or subsequent to the deposition of the catalytically active metal. Lockemeyer (2) does not teach a calcination step following the deposition. Nor, in the absence of any reason to cause a reaction with the carrier, would a person of ordinary skill in the art deposit the sodium promoter and then follow the deposition with a calcination step-- because a simple "drying" step suffices to remove the solvent and deposit the sodium--another reason the two references should not be combined.

Applicant also notes for the record that a portion of Lockemeyer (2) referencing sodium hydroxide, cited by the Examiner, is not using sodium hydroxide to impregnate an alpha-alumina carrier. Rather, the aqueous sodium hydroxide solution is added to a silver nitrate solution as one of the steps in the preparation of a silver-amine-oxalate stock solution for impregnation of the silver on the carrier. Notably, the next step of the procedure is to use filter wands to separate the resulting silver-containing precipitate from the sodium and nitrate ions that remain in solution. [0034-0040]

The Examiner then turns to Lockemeyer (3) as disclosing a step of washing the alpha-alumina based carrier prior to the deposition of the catalytic material. The proffered suggestion or motivation to include such a washing step with the teachings of Lockemeyer (1) is to cleanse the carrier efficiently and cost-effectively in order to reduce the concentration of undesirable ionizable species and prepare the carrier for deposition/impregnation of the catalytically reactive metal.

For the reasons set forth above, Applicant respectfully submits that the combination of Lockemeyer (1) and Lockemeyer (2) and Lockemeyer (3) is improper and requests that this rejection be withdrawn as the Office Action relies upon information gleaned only from Applicant's specification. MPEP § 2142 states that "impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of facts gleaned from the prior art". Further, MPEP § 2145 recognizes that "any judgment on obviousness is in a sense necessarily a reconstruction based on hindsight reasoning, but so long as it takes into account

only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper", quoting *In re McLaughlin*, 443 F.2d. 1392, 1395 (CCPA 1971).

The Office Action uses the same references **in further combination** with either US Patent No. 4,994,589 by Notermann, to reject claim 4, or US Patent No. 4,874,370 by Boxhoorn, to reject claim 5. For the reasons set forth above, the combination of references does not render the claims obvious.

In summary, applicant respectfully requests reconsideration of the rejection of claims 1-10 and further submits that claims 1-10 are in condition for allowance.

Respectfully submitted,

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